Unit 7: The Anti-Derivative

\[ f(x) = \int_0^x 5 \, dt \]
\[ g(x) = \int_0^x 3 \, dt \]
\[ h(x) = \int_0^x t \, dt \]
\[ j(x) = \int_0^x 2t+1 \, dt \]

<table>
<thead>
<tr>
<th>Function</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y = 5 )</td>
<td>( 5x )</td>
</tr>
<tr>
<td>( y = 3 )</td>
<td>( 3x )</td>
</tr>
<tr>
<td>( y = x )</td>
<td>( \frac{1}{2}x^2 )</td>
</tr>
<tr>
<td>( y = 2x+1 )</td>
<td>( x^2 + x )</td>
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</tbody>
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A function \( F(x) \) is said to be the anti-derivative of \( f(x) \) if and only if \( F'(x) = f(x) \).

The indefinite integral:
\[ \int f(x) \, dx = F(x) \]

notation for the antiderivative!

The integral as a power:
\[ \int x^n \, dx = \frac{1}{n+1} x^{n+1} + C \]

→ "\( x^n \) is the derivative of what?"

1. add 1 to the exponent
2. divide down \( \uparrow \)

eg.
\[ \int 5x \, dx = \frac{5}{2} x^2 + C \]
\[ \int x^2 + 5x + 6 \, dx = \frac{1}{3} x^3 + \frac{5}{2} x^2 + 6x + C \]